MATHEMATICS STANDARDS

Kindergarten

Number Sense

1.0 Number Relationships

- **1.1 Compare two or more sets of objects (up to 10 objects per group) and identify which set is equal to, more than, or less than the other.**
- **1.2 Count, recognize, represent, name, and order number of objects up to 30.**
- **1.3 Know that the larger numbers describe sets with more objects in them than the smaller numbers have.**

2.0 Addition and Subtraction

- **2.1 Use concrete objects to determine the answers to addition and subtraction problems with two numbers, each less than 10.**

3.0 Estimation

- 3.1 Recognize when an estimate is reasonable.

Algebra and Functions

1.0 Sorting and Classifying Objects

- **1.1 Identify, sort, and classify objects by attribute and identify which objects do not belong to a particular group.**

Measurement and Geometry

1.0 Measurement

- **1.1 Compare the length, weight, and capacity of objects (e.g., shorter, longer, taller, lighter, heavier, holds more).**
- **1.2 Understand concepts of time (e.g., morning, afternoon, evening, today, yesterday, tomorrow, week, month, year) and the tools used to measure time (e.g., clock, calendar).**
- **1.3 Name the days of the week.**
- **1.4 Identify the time (to the nearest hour) of everyday events (e.g., lunch time is 12 o'clock).**

2.0 Geometry

- 2.1 Identify and describe common geometric objects such as the circle, triangle, square, rectangle, cube, sphere, and cone.
- 2.2 Compare familiar plane (e.g., square, triangle) and solid objects (e.g., cube, sphere) by common attributes such as position, shape, size, roundness, and number of corners.

Statistics, Data Analysis, and Probability

1.0 Collecting Information

- 1.1 Pose informational questions, collecting data, then record the results using objects, pictures, and/or picture graphs.
- **1.2 Identify, describe, and extend simple patterns (e.g., circle, square, circle) by referring to their shapes, sizes, or colors.**

Mathematical Reasoning

1.0 Making Decisions about a Problem

1.1 Determine the approach, materials, and strategies to be used.

1.2 Use tools and strategies, such as manipulatives or sketches, to model problems.

2.0 Solve Problems & Justify Reasoning

2.1 Explain their reasoning when using concrete objects and/or pictorial representations to solve a problem.

2.2 Make precise calculations when solving a problem, and check the validity of the results in the context of a problem.

MATHEMATICS STANDARDS

Grade One

Number Sense

1.0 Number Relationships

- **1.1 Count, read, and write whole numbers to 100.**
- **1.2 Compare and order whole numbers to 100 by using the symbols for "less than", "equal to", or "greater than" (<, =, >).**
- **1.3 Represent equivalent forms of the same number to 20, using physical models, diagrams, and number expressions (e.g., 8 may be represented as 4 + 4, 5 + 3, 2 + 2 + 2 + 2, 10 - 2, 11 - 3).**
- **1.4 Count and group objects into ones and tens (e.g., three groups of 10 and 4 equals 34, or 30 + 4).**
- **1.5 Identify and know the value of coins then show different combinations of coins equaling the same value.**

2.0 Addition and Subtraction

- **2.1 Know and memorize the addition facts (sums to 20) and the corresponding subtraction facts.**
- **2.2 Use the inverse relationship (e.g., checking a subtraction problem using addition).**
- **2.3 Identify one more than, one less than, 10 more than, and 10 less than a given number.**
- **2.4 Count by 2s, 5s, and 10s to 100.**
- **2.5 Show the meaning of addition (putting together) and subtraction (taking away, compare, find the difference).**
- **2.6 Solve addition and subtraction problems with one- and two-digit numbers (e.g., 5 + 58 = __).**
- **2.7 Find the sum of three one-digit numbers.**

3.0 Estimation

- **3.1 Make reasonable estimates when comparing larger or smaller numbers.**

Algebra and Functions

1.0 Number Sentences

- **1.1 Write and solve number sentences from problem situations that express relationships involving addition and subtraction.**
- **1.2 Understand the meaning of the symbols for addition, subtraction, and equal to (+, -, =).**
- **1.3 Create problem situations that might lead to a given number sentence involving addition and subtraction.**

Measurement and Geometry

1.0 Measurement

- **1.1 Compare the length, width, and volume of two or more objects by using standard or nonstandard units.**
- **1.2 Tell time to the nearest half hour and relate time to events (e.g., before/after, shorter/longer).**

2.0 Geometry

- **2.1 Identify, describe, and compare triangles, rectangles, squares, and circles, including the faces of three-dimensional objects.**
- **2.2 Classify familiar plane and solid objects by common attributes, such as color, position, shape, size, roundness, or number of corners, and explain which attributes are being used for classification.**
- **2.3 Give and follow directions about location.**
- **2.4 Arrange and describe objects in space by proximity, position, and direction (e.g., near, far, below, above, up, down, behind, in front of, next to, left or right of).**

Statistics, Data Analysis, and Probability

1.0 Data

- **1.1 Sort objects and data by common attributes and describe the categories.**
- **1.2 Represent and compare data (e.g., largest, smallest, most often, least often) by using pictures, bar graphs, tally charts, and picture graphs.**

2.0 Patterning

- **2.1 Describe, extend, and explain ways to get to the next element in simple repeating patterns (e.g., rhythmic, numeric, color, shape).**

Mathematical Reasoning

1.0 Making Decisions about a Problem

- **1.1 Determine the approach, materials, and strategies to be used.**
- **1.2 Use tools, such as manipulatives or sketches, to model problems.**

2.0 Solve Problems & Justify Reasoning

- **2.1 Explain reasoning used and justify the procedures selected.**
- **2.2 Make precise calculations and check the validity of the results from the context of a problem.**

3.0 Make Connections

3.1 Note the connection between one problem and another

MATHEMATICS STANDARDS
Grade Two

Number Sense

1.0 Number Relationships

1.1 Count, read, and write whole numbers to 1,000 and identify the place value for each digit.

1.2 Use words, models, and expanded forms (e.g., 45 = 4 tens + 5) to represent numbers to 1,000.

1.3 Order and compare whole numbers to 1,000 by using the symbols <, =, >.

2.0 Addition and Subtraction

2.1 Understand and use the inverse relationship between addition and subtraction to solve problems and check solutions (e.g., an opposite number sentence for 8 + 6 = 14 is 14 - 6 = 8).

2.2 Find the sum or difference of two whole numbers up to three digits.

2.3 Use mental math to find the sum or difference to two-digit numbers.

3.0 Multiplication and Division

3.1 Use repeated addition, arrays, and count by multiples to do multiplication.

3.2 Use repeated subtraction, equal sharing, and form equal groups with remainders to do division.

3.3 Know/memorize multiplication tables of 2s, 5s, and 10s to ñ10 X 10.ò

4.0 Fractions and Decimals

4.1 Recognize, name, and compare unit fractions from 1/12 to 1/2.

4.2 Recognize fractions of a whole and parts of a group.

4.3 Know that all fractional parts together (e.g., four fourths) equal one whole.

5.0 Computation with Money

5.1 Solve problems using combinations of coins and bills.

5.2 Know and use decimal notation and the dollar and cent symbols for money.

6.0 Estimation

6.1 Recognize when an estimate is reasonable in measurements.

Algebra and Functions

1.0 Number Relationships

1.1 Use commutative and associative rules to simplify mental calculations and to check results.

1.2 Relate problem situations to number sentences involving addition and subtraction.

1.3 Solve addition and subtraction problems using data from simple charts, picture graphs, and number sentences.

Measurement and Geometry

1.0 Measurement

1.1 Measure the length of objects by repeating a nonstandard or standard unit.

1.2 Use different units to measure the same object and predict whether the measure will be greater or smaller when a different unit is used.

1.3 Measure the length of an object to the nearest inch and/or centimeter.

1.4 Tell time to the nearest quarter hour and know relationships of time (e.g., minutes in an hour, days in a month).

1.5 Determine the duration of intervals of time in hours (e.g.,11:00 a.m.-4:00 p.m.).

2.0 Geometry

2.1 Describe and classify plane and solid geometric shapes (e.g., circle, triangle) according to the number and shape of faces, edges, and vertices.

2.2 Put shapes together and take them apart to form other shapes.

Statistics, Data Analysis, and Probability

1.0 Data

1.1 Record numerical data in systematic ways, keeping track of what has been counted.

1.2 Represent the same data in more than one way.

1.3 Identify range and mode.

1.4 Ask and answer simple questions related to data representations.

2.0 Patterning

2.1 Recognize, describe, and extend patterns and determine a text term in linear patterns.

2.2 Solve problems in simple number patterns.

Mathematical Reasoning

1.0 Making Decisions about a Problem

1.1 Determine the approach, materials, and strategies to be used.

1.2 Use tools, such as manipulatives or sketches, to model problems.

2.0 Solving Problems and Justify Reasoning

2.1 Defend the approach, materials, and strategies to be used.

2.2 Make precise calculations and check the validity of the results from the context of the problem.

3.0 Make Connections

3.1 Note connections between one problem and another.

MATHEMATICS STANDARDS
Grade Three

Number Sense

1.0 Place Value

1.1 Count, read, and write whole numbers to 10,000.
1.2 Compare and order whole numbers to10,000.
1.3 Identify the place value for each digit in numbers to 10,000.
1.4 Round off numbers to 10,000 to the nearest ten, hundred, and thousand.
1.5 Use expanded notation to represent numbers (e.g., 3,206 = 3,000 + 200 + 6).

2.0 Computation

2.1 Find the sum or difference of two whole numbers between 0 and 10,000.
2.2 Memorize multiplication tables from 1 to 10.
2.3 Use the inverse relationship of multiplication and division to compute and check results.
2.4 Solve multiplication problems when multiplying by one-digit numbers.
2.5 Solve division problems when dividing by a one-digit number with no remainder.
2.6 Understand the special properties of 0 and 1 in multiplication and division.
2.7 Determine the unit cost when given the total cost and number of units.
2.8 Solve problems that require two or more of the skills mentioned above.

3.0 Fractions and Decimals

3.1 Compare equivalent fractions using drawings or concrete materials.
3.2 Add and subtract simple fractions.
3.3 Solve problems involving addition, subtraction, multiplication, and division of money amounts..
3.4 Understand that fractions and decimals are two different representations of the same concept (e.g., 50 cents is 1/2 of a dollar).

Algebra and Functions

1.0 Number Sentences

1.1 Represent relationships of quantities in the form of mathematical expressions, equations, or inequalities.
1.2 Solve problems involving numeric equations or inequalities.
1.3 Select the appropriate operation to make an expression true (e.g., 4 x 3 = 12).
1.4 Express simple unit conversions in symbolic form (e.g., in. = ___ feet x 12).
1.5 Recognize and use the commutative and associative properties of multiplication (e.g., if 5 x 7 x 3 = 105, then what is 7 x 3x 5?).

2.0 Functional Relationships

2.1 Solve simple problems involving a functional relationship between two quantities (e.g., find the total cost of multiple items given the cost per unit).
2.2 Extend and recognize a linear pattern.

Measurement and Geometry

1.0 Measurement

- **1.1 Choose the appropriate tools and units (metric and U.S.) and estimating and measuring the length, liquid volume, and weight/mass of given objects.**
- 1.2 Estimate or determine the area and volume of solid figures by covering them with squares or by counting the number of cubes that would fill them.
- **1.3 Find the perimeter of a polygon with integer sides.**
- **1.4 Carry out simple unit conversions within a system of measurement (e.g., centimeters and meters, hours and minutes).**

2.0 Geometry

- **2.1 Identify, describe, and classify polygons.**
- 2.2 Identify attributes of triangles (e.g., two equal sides for the isosceles triangle).
- 2.3 Identify attributes of quadrilaterals (e.g., parallel sides for the parallelogram, right angles for the rectangle).
- **2.4 Identify right angles in geometric figures or in appropriate objects and determine whether other angles are greater or less than a right angle.**
- **2.5 Identify, describe, and classify common three-dimensional geometric objects (e.g., cube, rectangular solid, sphere, prism, pyramid, cone, cylinder).**
- 2.6 Identify common solid objects that are the components needed to make a more complex solid object.

Statistics, Data Analysis, and Probability

1.0 Data

- **1.1 Identify whether common events are certain, likely, unlikely, or improbable.**
- **1.2 Record the possible outcomes for a simple event (e.g., tossing a coin) and systematically keeping track of the outcomes when the event is repeated many times.**
- **1.3 Summarize and display the results of probability experiments in a clear and organized way (e.g., using a bar graph).**
- 1.4 Use the results of probability experiments to predict future events.

Mathematical Reasoning

1.0 Make Decisions about a Problem

- 1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.
- **1.2 Determine when and how to break a problem into simpler parts.**

2.0 Solve Problems, Justify Reasoning

- **2.1 Use estimation to verify the reasonableness of calculated results.**
- **2.2 Apply strategies and results from simpler problems to more complex problems.**
- 2.3 Use a variety of methods (e.g., words, numbers, symbols) to explain mathematical reasoning.
- **2.4 Express the solution clearly and logically.**
- **2.5 Indicate the relative advantages of exact and approximate solutions to problems.**
- 2.6 Make precise calculations and check the validity of the results.

3.0 Make Connections

- 3.1 Evaluate the reasonableness of the solution.
- 3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
- 3.3 Develop generalizations of the results obtained and apply them in other circumstances.

MATHEMATICS STANDARDS
Grade Four

Number Sense

1.0 Place Value
- **1.1 Read and write whole numbers to millions.**
- **1.2 Order and compare whole numbers and decimals to two decimal places.**
- **1.3 Round whole numbers through the millions.**
- **1.4 Decide/explain when a rounded solution is appropriate.**
- **1.5 Explain different interpretations of fractions (e.g., parts of a whole, parts of a set, and division of whole numbers).**
- **1.6 Write tenths and hundredths in decimal and fraction notations and know the fraction and decimal equivalents for halves and fourths (e.g., 1/2 = 0.5 or .50; 7/4 = 1 3/4 = 1.75).**
- **1.7 Write the fraction represented by a drawing of parts of a figure; represent a given fraction by using drawings; and relate a fraction to a simple decimal on a number line.**
- **1.8 Use concepts of negative numbers.**
- **1.9 Identify, on a number line, the relative position of positive fractions, positive mixed numbers, and positive decimals to two decimal places.**

2.0 Computation - Decimals
- **2.1 Estimate and compute the sum or difference of whole numbers and positive decimals to two places.**
- **2.2 Round two-place decimals to one decimal or the nearest whole number and judge the reasonableness of the rounded answer.**

3.0 Computation - Whole Numbers
- **3.1 Solve addition and subtraction problems with multi-digit numbers.**
- **3.2 Demonstrate an understanding of, and the ability to use, standard algorithms for multiplying a multi-digit number by a two-digit number and for dividing a multi-digit number by a one-digit number; use relationships between them to simplify computations and to check results.**
- **3.3 Solve problems involving multiplication of multi-digit numbers by two-digit numbers.**
- **3.4 Solve problems involving division of multi-digit numbers by one-digit numbers.**

4.0 Factoring
- **4.1 Understand that many whole numbers break down in different ways (e.g., 12 = 4 x 3 = 2 x 6 = 2 x 2 x 3).**
- **4.2 Know that numbers such as 2, 3, 5, 7, and 11 do not have any factors except 1 and themselves and that such numbers are called prime numbers.**

Algebra and Functions

1.0 Number Sentences
- 1.1 Use letters, boxes, or other symbols to stand for any number in simple expressions or equations (e.g., demonstrating an understanding and the use of the concept of a variable).
- 1.2 Interpret and evaluate mathematical expressions that now use parentheses.

1.3 Use parentheses to indicate which operation to perform first when writing expressions containing more than two terms and different operations.

1.4 Use and interpret formulas (e.g., area = length x width or A = *lw)* to answer questions about quantities and their relationships.

1.5 Understand that an equation such as $y = 3x + 5$ is a prescription for determining a second number when a first number is given.

2.0 Manipulate Equations

2.1 Know equals added to equals are equal.

2.2 Know equals multiplied by equals are equal.

Measurement and Geometry

1.0 Area and Perimeter

1.1 Measure the area of rectangular shapes by using appropriate units, such as square centimeter (cm2), square meter (m2), square inch (in2), square yard (yd2), or square mile (mi2).

1.2 Recognize that rectangles that have the same area can have different perimeters.

1.3 Understand that rectangles that have the same perimeter can have different areas.

1.4 Understand and use formulas to solve problems involving perimeters and areas of rectangles and squares. Use those formulas to find the areas of more complex figures by dividing the figures into basic shapes.

2.0 Coordinate Grids

2.1 Draw the points corresponding to linear relationships on graph paper (e.g., draw 10 points on the graph of the equation $y = 3x$ and connect them by using a straight line).

2.2 Understand that the length of a horizontal line segment equals the difference of the *x*-coordinates.

2.3 Understand that the length of a vertical line segment equals the difference of the *y*-coordinates.

3.0 Geometry

3.1 Identify lines that are parallel and perpendicular.

3.2 Identify the radius and diameter of a circle.

3.3 Identify congruent figures.

3.4 Identify figures that have bilateral and rotational symmetry.

3.5 Know the definitions of a right angle, an acute angle, and an obtuse angle. Understand that 90°, 180°, 270°, and 360° are associated, respectively, with 1/4, 1/2, 3/4, and full turns.

3.6 Visualize, describe, and make models of geometric solids (e.g., prisms, pyramids) in terms of the number and shape of faces, edges, and vertices; interpret two-dimensional representations of three-dimensional objects; and draw patterns (of faces) for a solid that, when cut and folded, will make a model of the solid.

3.7 Know the definitions of different triangles (e.g., equilateral, isosceles, scalene) and identify their attributes.

3.8 Know the definition of different quadrilaterals (e.g., rhombus, square, rectangle, parallelogram, trapezoid).

Statistics, Data Analysis, and Probability

1.0 Data Analysis

- **1.1 Formulate survey questions; systematically collecting and representing data on a number line; and coordinating graphs, tables, and charts.**
- **1.2 Identify the mode(s) for sets of categorical data and the mode(s), median, and any apparent outliners for numerical data sets.**
- **1.3 Interpret one- and two-variable data graphs to answer questions about a situation.**

2.0 Making Predictions

- **2.1 Represent all possible outcomes for a simple probability situation in an organized way (e.g., tables, grids, tree diagrams).**
- **2.2 Express outcomes of experimental probability situations verbally and numerically (e.g., 3 out of 4; 3/4).**

Mathematical Reasoning

1.0 Make Decisions about a Problem

- **1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.**
- **1.2 Determine when and how to break a problem into simpler parts.**

2.0 Solve Problems and Justify Reasoning

- **2.1 Use estimation to verify the reasonableness of calculated results.**
- **2.2 Apply strategies and results from simpler problems to more complex problems.**
- **2.3 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.**
- **2.4 Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; supporting solutions with evidence in both verbal and symbolic work.**
- **2.5 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.**
- **2.6 Make precise calculations and check the validity of the results from the context of the problem.**

3.0 Make Generalizations

- **3.1 Evaluate the reasonableness of the solution in the context of the original situation.**
- **3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.**
- **3.3 Develop generalizations of the results obtained and applying them in other circumstances.**

MATHEMATICS STANDARDS

Grade Five

Number Sense

1.0 Relative Magnitude of Numbers

1.1 Estimate, round, and manipulate very large (e.g., millions) and very small (e.g., thousandths) numbers.

1.2 Interpret percents as a part of a hundred; find decimal and percent equivalents for common fractions and explain why they represent the same value; compute a given percent of a whole number.

1.3 Understand and compute positive integer powers of nonnegative integers; compute examples as repeated multiplication.

1.4 Determine the prime factors of all numbers through 50 and write the numbers as the product of their prime factors by using exponents to show multiples of a factor (e.g., 24 = 2 x 2 x 2 x 3 = 23 x 3).

1.5 Identify and represent on a number line decimals, fractions, mixed numbers, and positive and negative integers.

2.0 Computation

2.1 Add, subtract, multiply, and divide with decimals; add with negative integers; subtract positive integers from negative integers; and verify the reasonableness of the results.

2.2 Demonstrate proficiency with division, including division with positive decimals and long division with multi-digit divisors.

2.3 Solve simple problems, including ones arising in concrete situations, involving the addition and subtraction of fractions and mixed numbers (like and unlike denominators of 20 or less), and express answers in the simplest form.

2.4 Understand the concept of multiplication and division of fractions.

2.5 Compute and perform simple multiplication and division of fractions, and apply these procedures to solving problems.

Algebra and Functions

1.0 Simple Expressions

1.1 Use information taken from a graph or equation to answer questions about a problem situation.

1.2 Use a letter to represent an unknown number; write and evaluate simple algebraic expressions in one variable by substitution.

1.3 Know and use the distributive property in equations and expressions with variables.

1.4 Identify and graph ordered pairs in the four quadrants of the coordinate plane.

1.5 Solve problems involving linear functions with integer values; write the equation; and graph the resulting ordered pairs of integers on a grid.

Measurement and Geometry

1.0 Area and Volume

1.1 Derive and use the formula for the area of a triangle and of a parallelogram by comparing it with the formula for the area of a rectangle (i.e., two of the same triangles make a parallelogram with twice the area; a parallelogram is compared with a rectangle of the same area by cutting and pasting a right triangle on the parallelogram).

1.2 Construct a cube and rectangular box from two-dimensional patterns and use these patterns to compute the surface area for these objects.
1.3 Understand the concept of volume and use the appropriate units in common measuring systems (i.e., cubic centimeter [cm3], cubic meter [m3], cubic inch [in3], and cubic yard [yd3]) to compute the volume of rectangular solids.
1.4 Differentiate between, and use appropriate units of measures for, two- and three-dimensional objects (i.e., find the perimeter, area, volume).

2.0 Geometry

2.1 Measure, identify, and draw angles, perpendicular and parallel lines, rectangles, and triangles by using appropriate tools (e.g., straightedge, ruler, compass, protractor, drawing software).

2.2 Know that the sum of the angles of any triangle is 180ę and the sum of the angles of any quadrilateral is 360ę and use this information to solve problems.

2.3 Visualize and draw two-dimensional views of three-dimensional objects made from rectangular solids.

Statistics, Data Analysis, and Probability

1.0 Data

1.1 Know the concepts of mean, median, and mode; computing and comparing simple examples to show that they may differ.
1.2 Organize and display single-variable data in appropriate graphs and representations (e.g., histogram, circle graphs) and explain which types of graphs are appropriate for various data sets.
1.3 Use fractions and percentages to compare data sets of different sizes.
1.4 Identify ordered pairs of data from a graph and interpret the meaning of the data in terms of the situation depicted by the graph.
1.5 Know how to write ordered pairs correctly; for example, *(x,y)*.

Mathematical Reasoning

1.0 Making Decisions about a Problem

1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.
1.2 Determine when and how to break a problem into simpler parts.

2.0 Solve Problems and Justify Reasoning

2.1 Use estimation to verify the reasonableness of calculated results.
2.2 Apply strategies and results from simpler problems to more complex problems.
2.3 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models to explain mathematical reasoning.

2.4 Express the solution clearly and logically by using the appropriate mathematical notation and terms, and clear language; supporting solutions with evidence in both verbal and symbolic work.

2.5 Indicate the relative advantages of exact and approximate solutions to problems and giving answers to a specified degree of accuracy.

2.6 Make precise calculations and check the validity of the results from the context of the problem.

3.0 Make Connections

3.1 Evaluate the reasonableness of the solution in the context of the original situation.

3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.

3.3 Develop generalizations of the results obtained and apply them in other circumstances.

MATHEMATICS STANDARDS

Grade Six

Number Sense

1.0 Comparing and Ordering Numbers

1.1 Compare and order positive and negative fractions, decimals, and mixed numbers and place them on a number line.

1.2 Interpret and use ratios in different contexts (e.g., batting averages, miles per hour) to show the relative sizes of two quantities, using appropriate notations (a/b, *a* to *b*, *a:b*).

1.3 Use proportions to solve problems (e.g., determining the value of *N* if 4/7 = N/21, finding the length of a side of a polygon similar to a known polygon). Use cross-multiplication as a method for solving such problems, understanding it as the multiplication of both sides of an equation by a multiplicative inverse.

1.4 Calculate given percentages of quantities and solve problems involving discounts at sales, interest earned, and tips.

2.0 Calculating

2.1 Solve problems involving addition, subtraction, multiplication, and division of positive fractions and explain why a particular operation was used for a given situation.

2.2 Explain the meaning of multiplication and division of positive fractions and perform the calculations (e.g., *5/8 ÷ 15/16 = 5/8* x *16/15 = 2/3*).

2.3 Solve addition, subtraction, multiplication, and division problems, including those arising in concrete situations, that use positive and negative integers and combinations of these operations.

2.4 Determine the least common multiple and the greatest common divisor of whole numbers; use them to solve problems with fractions (e.g., to find a common denominator to add two fractions or to find the reduced form for a fraction).

Algebra and Functions

1.0 Writing Expressions

1.1 Write and solve one-step linear equations in one variable.

1.2 Write and evaluate an algebraic expression for a given situation, using up to three variables.

1.3 Apply algebraic order of operations and the commutative, associative, and distributive properties to evaluate expressions; and justify each step in the process.

1.4 Solve problems manually by using the correct order of operations or by using a scientific calculator.

2.0 Rates and Proportions

2.1 Convert one unit of measurement to another (e.g., from feet to miles, from centimeters to inches).

2.2 Demonstrate an understanding that *rate* is a measure of one quantity per unit value of another quantity.

2.3 Solve problems involving rates, average speed, distance, and time.

3.0 Patterns

3.1 Use variables in expressions describing geometric quantities (e.g., P = 2w + 21, A = 1/2 bh, C = π d - the formulas for the perimeter of a rectangle, the area of a triangle, and the circumference of a circle, respectively).

3.2 Express in symbolic form simple relationships arising from geometry.

Measurement and Geometry

1.0 Area and Volume

1.1 Understand the concept of a constant such as π; knowing the formulas for the circumference and the area of a circle.

1.2 Know common estimates of π (3.14; *22/7*) and use these values to estimate and calculate the circumference and the area of circles; compare with actual measurements.

1.3 Know and use the formulas for the volume of triangular prisms and cylinders (area of base x height); compare these formulas and explain the similarity between them and the formula for the volume of a rectangular solid.

2.0 Geometry

2.1 Identify angles as vertical, adjacent, complementary, or supplementary and provide descriptions of these terms.

2.2 Use the properties of complementary and supplementary angles and the sum of the angles of a triangle to solve problems involving an unknown angle.

2.3 Draw quadrilaterals and triangles from given information about them (e.g., a quadrilateral having equal sides but no right angles, a right isosceles triangle).

Statistics, Data Analysis, and Probability

1.0 Data

1.1 Compute the range, mean, median, and mode of data sets.

1.2 Understand how additional data added to data sets may affect these computations of measures of central tendency.

1.3 Understand how the inclusion or exclusion of outliers affects measures of central tendency.

1.4 Know why a specific measure of central tendency (mean, median, mode) provides the most useful information in a given context.

2.0 Limitations

2.1 Compare different samples of a population with the data from the entire population and identify a situation in which it makes sense to use a sample.

2.2 Identify different ways of selecting a sample (e.g., convenience sampling, responses to a survey, random sampling) and which method makes a sample more representative for a population.

2.3 Analyze data displays and explain why the way in which the question was asked might have influenced the results obtained and why the way in which the results were displayed might have influenced the conclusions reached.

2.4 Identify data that represent sampling errors and explain why the sample (and the display) might be biased.

2.5 Identify claims based on statistical data and, in simple cases, evaluating the validity of the claims.

3.0 Probabilities

3.1 Represent all possible outcomes for compound events in an organized way (e.g., tables, grids, tree diagrams) and express the theoretical probability of each outcome.

3.2 Use data to estimate the probability of future events (e.g., batting averages or number of accidents per mile driven).

3.3 Represent probabilities as ratios, proportions, decimals between 0 and 1, and percentages between 0 and 100 and verify that the probabilities computed are reasonable; knowing that if *P* is the probability of an event, 1-*P* is the probability of an event not occurring.

3.4 Understand that the probability of either of two disjoint events occurring is the sum of the two individual probabilities and that the probability of one event following another, in independent trials, is the product of the two probabilities.

3.5 Understand the difference between independent and dependent events.

Mathematical Reasoning

1.0 Making Decisions about a Problem

1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, and observing patterns.

1.2 Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed.

1.3 Determine when and how to break a problem into simpler parts.

2.0 Solving Problems & Justify Reasoning

2.1 Use estimation to verify the reasonableness of calculated results.

2.2 Apply strategies and results from simpler problems to more complex problems.

2.3 Estimate unknown quantities graphically and solve for them using logical reasoning and arithmetic and algebraic techniques.

2.4 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.

2.5 Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.

2.6 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.

2.7 Make precise calculations and check the validity of the results from the context of the problem.

3.0 Make Connections

3.1 Evaluate the reasonableness of the solution in the context of the original situation.

3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.

3.3 Develop generalizations of the results obtained and the strategies used and apply them in new circumstances.

MATHEMATICS STANDARDS
Grade Seven

Number Sense

1.0 Computing

1.1 Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.

1.2 Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.

1.3 Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.

1.4 Differentiate between rational and irrational numbers.

1.5 Know that every rational number is either a terminating or repeating decimal and be able to convert terminating decimals into reduced fractions.

1.6 Calculate the percentage of increases and decreases of a quantity.

1.7 Solve problems involving discounts, markups, commissions, and profit and compute simple and compound interest.

2.0 Fractions

2.1 Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base.

2.2 Add and subtract fractions by using factoring to find common denominators.

2.3 Multiply, divide, and simplify rational numbers by using exponent rules.

2.4 Use the inverse relationship between raising to a power and extracting the root of a perfect square integer; for an integer that is not square, determine, without a calculator, the two integers between which its square root lies and explain why.

2.5 Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers.

Algebra and Functions

1.0 Writing Expressions

1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g., three less than a number, half as large as area A).

1.2 Use the correct order of operations to evaluate algebraic expressions such as $3(2x + 5)2$.

1.3 Simplify numerical expressions by applying properties of rational numbers (e.g., identify, inverse, distributive, associative, commutative) and justify the process used.

1.4 Use algebraic terminology (e.g., variable, equation, term, coefficient, inequality, expression, constant) correctly.

1.5 Represent quantitative relationships graphically and interpret the meaning of a specific part of a graph in the situation represented by the graph.

2.0 Evaluating Expressions

2.1 Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents.

2.2 Multiply and divide monomials; extending the process of taking powers and extracting roots to monomials when the latter results in a monomial with an integer exponent.

3.0 Linear and Nonlinear Functions

3.1 Graph functions of the form *y = nx2 and y = nx3* and using in solving problems.

3.2 Plot the values from the volumes of three-dimensional shapes for various values of the edge lengths (e.g., cubes with varying edge lengths or a triangle prism with a fixed height and an equilateral triangle base of varying lengths).

3.3 Graph linear functions, noting that the vertical change (change in *y*-value) per unit of horizontal change (change in *x*-value) is always the same and know that the ration (ñrise over runò) is called the slope of a graph.

3.4 Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.

4.0 Linear Equations

4.1 Solve two-step linear equations and inequalities in one variable over the rational number, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results.

4.2 Solve multi-step problems involving rate, average speed, distance, and time or a direct variation.

Measurement and Geometry

1.0 Measurement

1.1 Compare weights, capacities, geometric measures, times, and temperatures within and between measurement systems (e.g., miles per hour and feet per second, cubic inches to cubic centimeters).

1.2 Construct and read drawings and models made to scale.

1.3 Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.

2.0 Perimeter and Area

2.1 Use formulas routinely for finding the perimeter and area of basic two-dimensional figures and the surface area and volume of basic three-dimensional figures, including rectangles, parallelograms, trapezoids, squares, triangles, circles, prisms, and cylinders.

2.2 Estimate and compute the area of more complex or irregular two- and three-dimensional figures by breaking the figures down into more basic geometric objects.

2.3 Compute the length of the perimeter, the surface area of the faces, and the volume of a three-dimensional object built from rectangular solids. Understand that when the lengths of all dimensions are multiplied by a scale factor, the surface area is multiplied by the square of the scale factor and the volume is multiplied by the cube of the scale factor.

2.4 Relate the changes in measurement with a change of scale to the units used (e.g., square inches, cubic feet) and to conversions between units (1 square foot = 144 square inches or [1 ft2] = [144 in2], 1 cubic inch is approximately 16.38 cubic centimeters or [1 in3] = [16.38 cm3]).

3.0 Geometry

3.1 Identify and construct basic elements of geometric figures (e.g., altitudes, midpoints, diagonals, angle bisectors, and perpendicular bisectors; central angles, radii, diameters, and chords of circles) by using a compass and straightedge.

3.2 Understand and use coordinate graphs to plot simple figures, determining lengths and area relating to them, and determine their image under translations and reflections.

3.3 Know and understand the Pythagorean Theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verifying the Pythagorean Theorem by direct measurement.

3.4 Demonstrate an understanding of conditions that indicate two geometrical figures are congruent and what congruence means about the relationships between the sides and angles of the two figures.

3.5 Construct two-dimensional patterns for three-dimensional models, such as cylinders, prisms, and cones.

3.6 Identify elements of three-dimensional geometric objects (e.g., diagonals of rectangular solids) and describing how two or more objects are related in space (e.g., skew lines, the possible ways three planes might intersect).

Statistics, Data Analysis, and Probability

1.0 Data

1.1 Know various forms of display for data sets, including a stem-and-leaf plot or box-and-whisker plot; using the forms to display a single set of data or to compare two sets of data.

1.2 Represent two numerical variables on a scatterplot and informally describe how the data points are distributed and any apparent relationship that exists between the two variables (e.g., between time spent on homework and grade level).

1.3 Understand the meaning of, and be able to compute, the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.

Mathematical Reasoning

1.0 Make Decisions about a Problem

1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.

1.2 Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed.

1.3 Determine when and how to break a problem into simpler parts.

2.0 Solving Problems and Justifying Reasoning

2.1 Use estimation to verify the reasonableness of calculated results.

2.2 Apply strategies and results from simpler problems to more complex problems.

2.3 Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.

2.4 Make and test conjectures by using both inductive and deductive reasoning.
2.5 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
2.6 Express the solution clearly and logically by using the appropriate mathematical notation and terms.
2.7 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
2.8 Make precise calculations and check the validity of the results from the context of the problem.

3.0 Make Connections

3.1 Evaluate the reasonableness of the solution in the context of the original situation.
3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
3.3 Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.

MATHEMATICS STANDARDS

Grade Eight

Algebra I

By the end of Algebra I, your child will:

1.0 Identify and use the arithmetic properties of subsets of integers and rational, irrational, and real numbers, including closure properties for the four basic arithmetic operations where applicable.

1.1 Use properties of numbers to demonstrate whether assertions are true or false.

2.0 Understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. Also understand and use the rules of exponents.

3.0 Solve equations and inequalities involving absolute values.

4.0 Simplify expressions before solving linear equations and inequalities in one variable, such as $3(2x-5) + 4(x-2) = 12$.

5.0 Solve multi-step problems, including word problems, that involve linear equations and linear inequalities in one variable and provide justification for each step.

6.0 Graph a linear equation and compute the *x*- and *y*-intercepts (e.g., graph $2x + 6y = 4$). Also sketch the region defined by linear inequalities (e.g., they sketch the region defined by $2r + 6y < 4$).

7.0 Verify that a point lies on a line, given an equation of the line and derive linear equations by using the point-slope formula.

8.0 Understand the concepts of parallel lines and perpendicular lines and how those slopes are related. Also find the equation of a line perpendicular to a given line that passes through a given point.

9.0 Solve a system of two linear equations in two variable algebraically and interpret the answer graphically. Also solve a system of two linear inequalities in two variables and sketch the solution sets.

10.0 Add, subtract, multiply, and divide monomials and polynomials. Also solve multi-step problems, including word problems, by using these techniques.

11.0 Apply basic factoring techniques to second- and simple third-degree polynomials. These techniques include finding a common factor for all terms in a polynomial, recognizing the difference of two squares, and recognize perfect squares of binomials.

12.0 Simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.

13.0 Add, subtract, multiply, and divide rational expressions and functions. Also solve both computationally and conceptually challenging problems by using these techniques.

14.0 Solve a quadratic equation by factoring or completing the square.

15.0 Apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.

16.0 Understand the concepts of a relation and a function, determining whether a given relation defines a function, and give pertinent information about given relations and functions.

17.0 Determine the domain of independent variables and the range of dependent variables defined by a graph, a set of ordered pairs, or a symbolic expression.

18.0 Determine whether a relation defined by a graph, a set of ordered pairs, or a symbolic expression is a function and justify the conclusion.

19.0 Know the quadratic formula and be familiar with its proof by completing the square.

20.0 Use the quadratic formula to find the roots of a second-degree polynomial and solve quadratic equations.

21.0 Graph quadratic functions and know that their roots are the *x*-intercepts.

22.0 Use the quadratic formula or factoring techniques or both to determine whether the graph of a quadratic function will intersect the x-axis in zero, one, or two points.

23.0 Apply quadratic equations to physical problems, such as the motion of an object under the force of gravity.

24.0 Use and know simple aspects of a logical argument including:
- 24.1 Explain the difference between inductive and deductive reasoning and identify and provide examples of each.
- 24.2 Identify the hypothesis and conclusion in logical deduction.
- 24.3 Use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion.

25.0 Use properties of the number system to judge the validity of results, justify each step of a procedure, and prove or disprove statements such as:
- 25.1 Use properties of numbers to construct simple, valid arguments (direct and indirect) for, or formulate counterexamples to, claimed assertions.
- 25.2 Judge the validity of an argument according to whether the properties of the real number system and the order of operations have been applied correctly at each step.
- 25.3 Given a specific algebraic statement that involve linear, quadratic, or absolute value expressions, equations or inequalities, determine whether the statement is true sometimes, always, or never.